

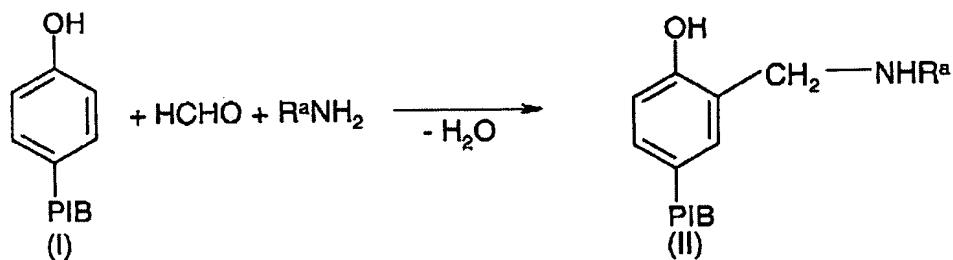
REQUEST FOR RECONSIDERATION

Applicants thank Examiner Toomer for the helpful and courteous discussion of April 26, 2005. During the discussion, Applicants' U.S. representative pointed out that independent Claim 1 of the present application requires that the amine either (i) have "no primary amino function" or (ii) "be an adduct with formaldehyde, an oligomer of formaldehyde, a polymer of formaldehyde or a formaldehyde equivalent".

One embodiment of the invention includes a process by which a Mannich reaction is carried out on a butylated aromatic compound. The Mannich reaction includes condensing the butylated phenol with formaldehyde and an amine.

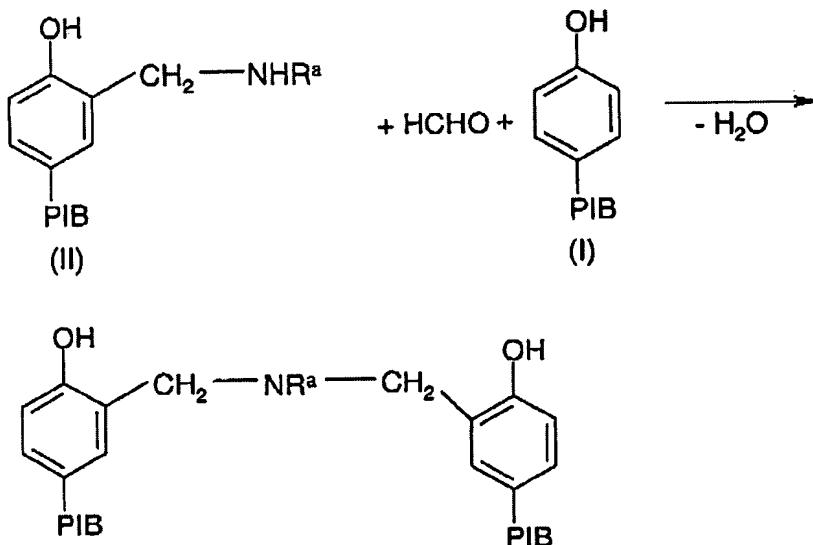
In the reaction scheme shown below, when all three of the isobut enyl phenol, the amine and the formaldehyde are reacted in a one-pot reaction, it is possible that the amine (e.g., a primary amine) will react with more than one formaldehyde group during the Mannich reaction and form a mixture of Mannich adduct products that is non-uniform in comparison to the uniform mixture of Mannich adducts obtained when an amine/formaldehyde adduct is reacted with the isobut enyl phenol.

In the first step of the reaction the phenol (I) is aminoalkylated and a secondary amine (II) is obtained:

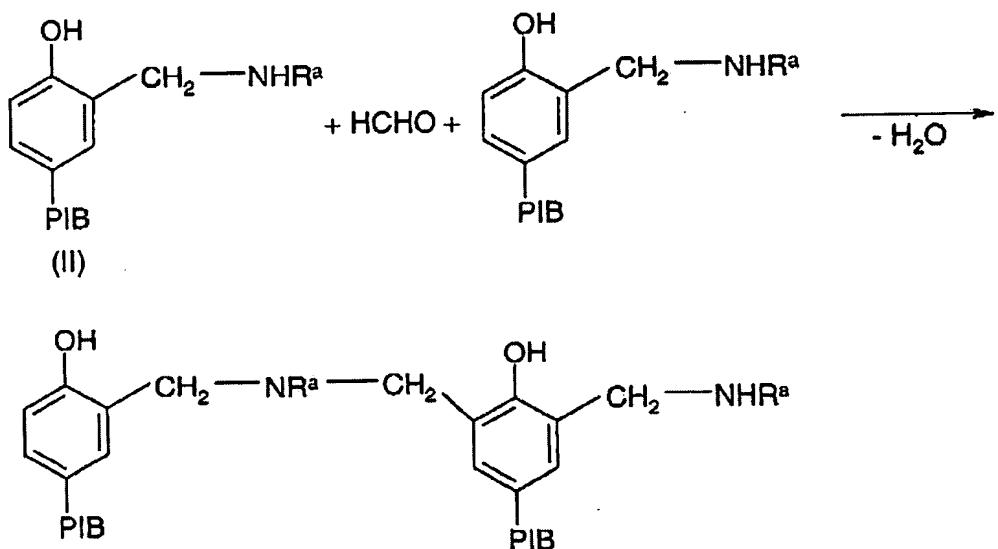


R^a ≠ H

The secondary amines (II) are much more reactive than the primary amines R^aNH₂ and react in a concurrent reaction with formaldehyde and phenol (I):

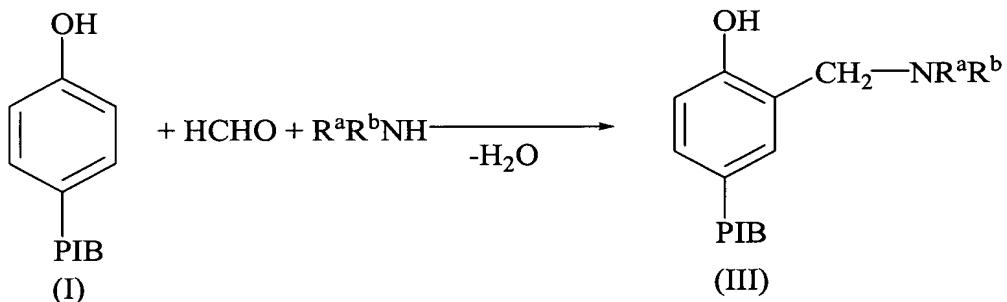


Further consecutive aminoalkylation reactions will also occur:



Applicants submit that carrying out a Mannich reaction by mixing all three of an isobut enyl phenol, an amine and a formaldehyde may yield a non-uniform reaction product (such as that obtained when the amine reacts with more than one formaldehyde unit).

Claim 1 of the present application requires that the amine component of the Mannich reaction "has at least one secondary amino function and no primary amino function". Thus, Claim 1 excludes certain amines (i.e., primary amines). According to Claim 1 an amine having no primary amino function is employed:

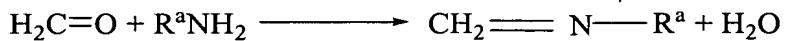


Here a tertiary amine (III) is obtained that has no active hydrogen atoms capable of a Mannich condensation.

New independent Claim 20 requires that an adduct is formed between the amine and the formaldehyde before the Mannich reaction is carried out in the presence of the butylated phenol. Formation of an amine/formaldehyde adduct in advance permits the formation of a more uniform Mannich adduct in the later reaction.

As an example, Applicants show below a reaction scheme wherein the amine/formaldehyde adduct is formed first to form, for example, an aminal, hemiaminal, etc. The aminal may then react with isobut enyl phenol to form the desired Mannich adduct.

If the amine employed according to this variant is a primary amine this of course prevents consecutive reactions.



Applicants have described an advantage of forming an amine/formaldehyde adduct before reaction with the isobutenylphenol. One aspect of this advantage is the formation of a more uniform product (e.g., the formation of fewer side products such as products wherein multiple formaldehyde units are reacted with the amine during the Mannich reaction.)

Applicants submit that the Colucci patent (U.S. 5,634,951), cited by the Office in rejecting the present claims as anticipated, does not disclose reacting an alkylation product of a phenol and polyisobutene with an amine having *no primary amino function* (i.e., present Claim 1) or an amine that is an *adduct with a formaldehyde* (i.e., present Claim 20). In fact, Colucci describes the prior art amine as follows:

A very important feature of this invention is the use of an aliphatic polyamine having one and only one primary or secondary amino group in the molecule capable of entering into the Mannich condensation reaction with the alkyl phenolic compound and the aldehyde.

Colucci does not disclose that the amine of the prior art must have no primary amino function or must be an adduct with formaldehyde.

Colucci discloses several examples each of which uses the amine DMPD (i.e., N,N-dimethyl-1,3-propane diamine; see column 9, lines 21-22). The N,N-dimethyl-1,3-propane diamine molecule contains a first nitrogen atom bonded to two hydrogen groups, one bridging propane group and a second nitrogen atom is bonded to two methyl groups. It is important to distinguish N,N-substitution from N,N'-substitution. In the former (i.e., N,N-) both methyl groups are bonded to a single nitrogen atom whereas in the latter (i.e., N,N'-) the methyl groups are bonded to two different nitrogen atoms (see the attached information describing this compound obtained from www.aldrich.com). An N,N-substituted molecule has one primary amine function and one tertiary amine function. A N,N'-substituted molecule has two secondary amine functions.

- Application No. 10/089,064
Reply to Office Action of March 29, 2005.

While Colucci may suggest the reaction of an isobutenylphenol with an amine having a secondary amino group or an amine having a primary amino group, and formaldehyde, Colucci does not disclose embodiment where primary amines are explicitly excluded. Applicants submit that Colucci does not describe the presently claimed invention (i.e., the exclusion of primary amines or use of an amine/formaldehyde adduct) and cannot therefore anticipate the claims.

By excluding amines having primary amino groups from the reaction of the isobutenyl phenol, the amine and formaldehyde, it is possible to obtain a more desirable Mannich adduct. This aspect of the invention is not recognized by Colucci nor does Colucci recognize the criticality of excluding such an amine. Applicants have recognized the problems associated with reacting amines having primary amino groups in Mannich reactions between alkyl phenols, amines and formaldehyde and have claimed an invention that eliminates these problems.

Likewise, Colucci does not disclose the use of an adduct of an amine with a formaldehyde compound as a separate component of a Mannich reaction. Applicants submit that because Colucci does not disclose all of the limitations of present Claims 1, 10 and 20, Colucci cannot anticipate or render obvious the present claims.

Applicants respectfully request the withdrawal of the rejection.

Applicants have described the importance of carrying out the reaction with an amine adduct in the specification. On page 8, lines 21-35 the importance and consequences of carrying out the reaction with an amine adduct are disclosed. For example it is stated:

What is important for the preparation of the novel Mannich adducts by this variant is that an adduct is formed from at least one amine and a formaldehyde source or a formaldehyde equivalent in the absence of the polyisobutenyl phenol, and this adduct is only then reacted with the polyisobutenyl phenol. Starting from amines which have one or more primary amino groups, this process 2 leads to the formation of the novel, advantageous Mannich adducts having a high proportion of

nitrogen-containing compounds and mixtures having a molecular weight distribution substantially narrower than the prior art. (page 8, lines 25-35).

Thus, Applicants have disclosed that using an adduct of an amine and a formaldehyde as a separate component for reaction with a butylated phenol provides a more uniform product.

With respect to the rejections in view of Worrel, Applicants note that the amines of Worrel (U.S. 3,413,347) must contain a primary amino group. Such primary amino groups are explicitly excluded by step b) of original independent Claim 1.

The Office admits that Worrel does not teach the reaction of an alkyl phenol with an amine/formaldehyde adduct. The Office asserts that it would be obvious to first form the amine/formaldehyde adduct “because selection of any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results.” Applicants submit that the requirement that an amine/formaldehyde adduct is formed first before reaction with the isobut enyl phenol must necessarily be new and non-obvious in view of the prior art because a new chemical compound is formed. Worrel nowhere discloses the formation of an amine/formaldehyde adduct such as an aminal. Therefore the claimed process which uses an amine/formaldehyde adduct must be patentable with respect to Worrel.

Applicants further submit that Worrel discloses that certain Mannich reaction products may be obtained from alkylphenols having a number average molecular weight of from 550 to 1400. Worrel may teach the use of polybutenes but not polyisobutenes (see the monomers disclosed at column 3, line 11). Applicants also submit that the presently claimed invention is different from the process disclosed in Worrel as evidenced by the requirement of the presently claimed invention that the polyolefin has a PD of less than 3.0 and a M_n of less than 1000. Thus the invention is further not obvious in view of the combination of

- Application No. 10/089,064
Reply to Office Action of March 29, 2005.

Worrel with any of the other prior art references cited against the claims in the present application.

Further in support of patentability, Applicants note that the process of Claim 20 provides a different reaction product (e.g., a more uniform Mannich adduct) and therefore submit that the claimed process is novel and not obvious in view of the prior art cited by the Office.

Applicants respectfully request the withdrawal of the rejections.

The Office rejected the present claims under obviousness-type double patenting in view of co-pending application 10/089,056. The rejections are provisional rejections because the claims of the present application and the co-pending application have not yet been patented. Applicants request the Office hold the rejections in abeyance until one of the present application or co-pending 10/089,056 is, in fact, patented.

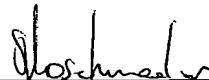
- Application No. 10/089,064
Reply to Office Action of March 29, 2005.

INFORMATION DISCLOSURE STATEMENT

Upon filing of the present application, Applicants submitted a Information Disclosure Statement on April 5, 2002. The IDS provided three foreign patent documents. The Office returned a signed, and partially dated copy of the IDS of April 2, 2002 with the Office Action of March 29, 2005. Applicants note that it appears that one of the foreign patent documents may not have been initialed as considered by the Office during prosecution of the present application. Applicants respectfully request the Office return a sign, dated and initialed copy of the form PTO-1449 submitted on April 5, 2002 to acknowledge that all of the foreign patent documents provided thereon have been considered during the examination of the present application (e.g., the Examiner's initials next to Ref. No. AP).

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.
Norman F. Oblon



Stefan U. Koschmieder, Ph.D.
Registration No. 50,238

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 06/04)
SUK/fac